

# Analysis of FSR, LANMAR and DYMO under MANET

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**Abstract**— A movable ad hoc system (MANET) is a self-configuring communications set of connections of mobile procedure associated by wireless. Each mechanism in a MANET is free to move independently in some way, and will therefore modify its relations to other devices frequently [2]. The primary purpose of any ad-hoc network routing protocol is to meet the challenges of the dynamically changing topology and establish an efficient route connecting every two nodes. In this paper three protocols FSR, LANMAR and DYMO are compared by using random waypoint mobility in few nodes with varying packet sizes in CBR traffic. The parameters or metrics are used to assess the performance of protocols with and without Black Hole attack, that are data Packet Delivery ratio and Average Jitter with varying data traffic CBR (Constant Bit Ratio) using Qual Net 5.0.2 simulator.

**Index Terms**— Adhoc networks, FSR, DYMO and LANMAR, Black Hole Attack.

## I. INTRODUCTION

A mobile ad hoc network is a anthology of wireless mobile nodes that dynamically establishes the network in the absence of fixed infrastructure. One of the individual characteristics of MANET is, each node must be able to act as a router to find out the optimal path to forward a packet. As nodes might be movable toward the inside and leave-taking the network, the topology of the system will change incessantly [1]. MANETs supply an up-and-coming knowledge for civilian and martial application. One of the important investigate areas in MANET is establishing and maintaining the ad hoc network through the use of routing protocols. Although there are so many direction-finding protocols available, this paper considers FSR, LANMAR, and DYMO for performance comparisons. These protocols are analyzed based on the important metrics such a packet delivery ratio and jitter. Most of the research study shows that DYMO and DSR are performing well depend upon the surroundings, in the middle of the reactive protocols. In Proactive, FSR, TORA and LANMAR protocols are performing fine. The performance of different proactive, reactive and hybrid protocols have an analyzed by different researchers. The comparative analysis of FSR, LANMAR and DYMO is proposed in this paper.

## II. ROUTING PROTOCOLS

MANET routing protocols are categorized into two main categories depending upon the criteria when the source node possesses a route to the destination.

Table driven/ Proactive

Source initiated (demand driven) / Reactive

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*Table Driven Routing Protocols:* Table driven also known as proactive protocols maintain reliable and up to date routing information between all the nodes in an ad hoc network. In this every node build its own routing table which can be used to find out a path to a destination and routing in sequence is stored [4]. Whenever there is any difference in the set of connections topology, updation has to be made in the entire network. Some of the main table driven protocols are:

- Optimized Link State Routing protocol (OLSR)
- Destination sequenced Distance vector routing (DSDV)
- Wireless routing protocol (WRP)
- Fish eye State Routing protocol (FSR)
- Cluster Gateway switch routing protocol (CGSR)

*Source Initiated Routing Protocols:* In On-demand or Reactive routing protocols routes are formed as and when required [3]. When a node requirements to send data to any other node, it first initiate route discovery process to discover the path to that destination node. This path residue applicable till the destination is accessible or the route is not required. unusual types of on demand driven protocols have been developed such as:

- Ad hoc On Demand Distance Vector (AODV)
- Dynamic Source routing protocol (DSR)
- Temporally ordered routing algorithm (TORA)

#### A. Fisheye State Routing (FSR)

FSR is an implicit hierarchical routing protocol [8]. It uses the “fisheye” technique proposed by Klein rock and Stevens, where the technique was used to reduce the size of information required to represent graphical data. The eye of a fish captures more detail pixels near the focal point. The detail relegate as the distance from the focal point increment. In routing scheme, this approach translates to maintain accurate distance and path quality in sequence about the neighborhood of a node [6]. FSR is a hierarchical routing protocol. It maintain the topology of the set of connections at every node but does not flood the entire network with information. Instead of flooding, node exchanges topology information only with its neighbors. Recent topology changes are identified using sequence numbers.

#### B. Dymo

It is a successor of AODV. It is a combination of AODV and DSR routing protocols. Similar to AODV, DYMO has two main operations, route discovery and route preservation [5]. In route discovery, the sender node broadcast a RREQ message all through the network to find the purpose join. Throughout this procedure each in among nodes records a route to the source node and rebroadcast the RREQ after appending its own address. This is called the path a accretion function. When the destination node receives the RREQ, it responds with RREP to the resource node. Each intermediate node that receives the RREP records a route to the principle node [7]. When the basis node receives RREP message, the route is established between the source node and the destination node. As path buildup function can reduce the route overhead, and the small package size of the routing packet is increased. When a link break, the source of the packet is notified RERR message is send to the sender node like acknowledgement.

#### C. Lanmar

Landmark ad hoc routing protocol (LANMAR)The Landmark Ad-hoc Routing Protocol (LANMAR) is designed to dramatically reduce routing table size and routing update overhead in large-scale ad-hoc networks that exhibit group mobility. LANMAR same as the features of (FSR) and; this added some features like landmark election to cope with the dynamic and mobile environment [9]. Other benefits of LANMAR include the uses of landmark for each logical group in order to reduce routing update overhead, and the exchange of “scoped” link state with neighbors only. By asset of ground spot, isolated group of nodes are “summarized by the corresponding landmarks [10]. As a result, each node still maintains accurate routing information about immediate neighborhood; at the same time it will keep track of the routing directions to the landmark nodes, and thus, to distant collection.

### III. SIMULATION AND RESULTS

In this section the work made on comparing the performance of FSR, LANMAR and DYMO routing Protocols has been discussed. The number of nodes chosen is 15,25,50,70 and 100 in a network of size 1500m X 1500 m and the nodes were deployed in a random manner[15]. The simulation was done for all the

three routing protocols. The performance of LANMAR, DYMO and FSR protocols were evaluated with respect to parameters such as packet delivery ratio and average jitter as shown below in table 1 with a mobile and immobile network with Black hole Attack using Qualnet 5.1

TABLE I. PERFORMANCE METRICS

Packet delivery ratio	It is the ratio that illustrates the total amount of packets delivered to the destination.
Average Jitter	Jitter is the dissimilarity in the time between packets incoming, caused by congestion.

#### A. Literature Survey

In recent years, several researchers have studied and analyzed various ad-hoc Routing Protocols taking into consideration different metrics as basis for performance assessment. They have used dissimilar simulators and real-world environment for the same.

Pradish Dadhania, Sachin Patel [1], "Performance Evaluation of Routing Protocol like AODV and DSR under Black Hole Attacks" In this paper, via simulation, we evaluate effect and compare it with standard protocol in terms of throughput, Packet delivery ratio and End to End Delay. We have conducted extensive experiments using the network simulator-2 to validate our research.

Jaspal Kumar, M. Kulkarni, Daya Gupta [2] "Effect of Black Hole Attack on MANET Routing Protocols" In this paper we have analyzed the effects of Black hole attack on mobile ad hoc routing protocols.

Dependra Dhaka, Karan Gautam [3] "Performance Comparison of AODV and DSR Routing Protocols in Mobile Ad- hoc Networks: A Survey" The objective of this survey is to review the AODV and DSR protocols based on the performance metrics such as mobility pattern, packet delivery ratio, average end to end delay, throughput, packet drop, node density .

Harjeet Kaur , Manju Bala , Varsha Sahni [4] , "Performance Evaluation Of AODV, OLSR and ZRP Routing Protocols Under The Black Hole Attack In Manet .

R. Parthasar A. Pravin Renold [5], "Performance Analysis of OLSR, AODV and ZRP with Fault in Mobile Ad Hoc Networks" In this paper we analyzed the performance of OLSR (Optimized Link State Routing), AODV and ZRP routing protocol.

YatinChauhan, Prof Jaikaran Singh, Prof Mukesh Tiwari, Dr Anubhuti Khare [6], "Performance Evaluation of AODV based on black hole attack in ad hoc network" This paper illustrates how BlackHole attack can affect the performance of routing protocol, AODV, in Mobile Ad hoc networks.

Anuj Gupta, Navjot Kaur, AmandeepKaur [7] , "A Survey on Behaviour of AODV and OLSR Routing Protocols of Manets under Black Hole Attack" In this study we investigated the effects of Black Hole attacks on the reactive and proactive manet protocols.

Surbhi Sharma, Himanshu Sharma [8], "Performance Comparison of AODV, DSR, DYMO and ANODR using QUALNET simulator" This paper presents the effect of node density on the performance of four reactive routing protocols .

Parma Nand, Dr. S.C. Sharma [9] , "Comparative study and Performance Analysis of FSR, ZRP and AODV Routing Protocols for MANET" In this paper hybrid routing protocol called Zone Routing Protocol (ZRP), Fisheye State Routing Protocol (FSR) and Ad Hoc On-Demand Distance-Vector Protocol (AODV) are examined.

Dependra Dhakal, Kiran Gautam [10], "Performance Comparison of AODV and DSR Routing Protocols in Mobile Ad- hoc Networks" This paper presents a survey with an objective to compare Ad-Hoc routing protocols taking into consideration different network.

Parma Nand ,S C Sharma [11] , "Traffic Load based Performance Analysis of DSR, STAR & AODV Adhoc Routing Protocol" In this paper table driven protocol STAR and on demand routing protocol AODV, DSR based on IEEE 802.11 are surveyed .

A.Boomarani Malany , V.R.Sarma Dhulipala, and RM.Chandrasekaran [12] . "Throughput and Delay Comparison of MANET Routing Protocols" routing protocols like Ad hoc On-Demand Vector routing (AODV), Fisheye, Dynamic MANET On-demand (DYMO), Source Tree Adaptive Routing (STAR).

#### B. Comparative Analysis

Comparison of FSR, LANMAR and DYMO. We compare the performance of FSR, LANMAR and DYMO using the performance metrics packet delivery ratio and Average jitter with and without attack.

TABLE II. SIMULATION PARAMETERS [1]

Parameters	Values
Routing Protocols	802.11
MAC Layer	512 Bytes
Packet Size	512 Bytes
Terrain Size	1500*1500
Nodes	15,25,50,70 and 100
Mobility Model	Random Waypoint Model
Data Traffic Rate	CBR
No. of Source	5
Simulation duration	30 sec
CBR Traffic Rate	8 packet/sec
Attack Type	Black hole Attack

### C. Packet Delivery Ratio

Packet delivery ratio is the fraction of packets sent by the application that are received by the receivers and is calculated by dividing the number of packets received by the destination through the number of packets originated by the application layer of the source [14]. For better presentation of a routing protocol, it should be better. The Packet Delivery Ratio of FSR, LANMAR and DYMO with and without Black Hole attack as shown in fig 1, fig 2 and fig 3.

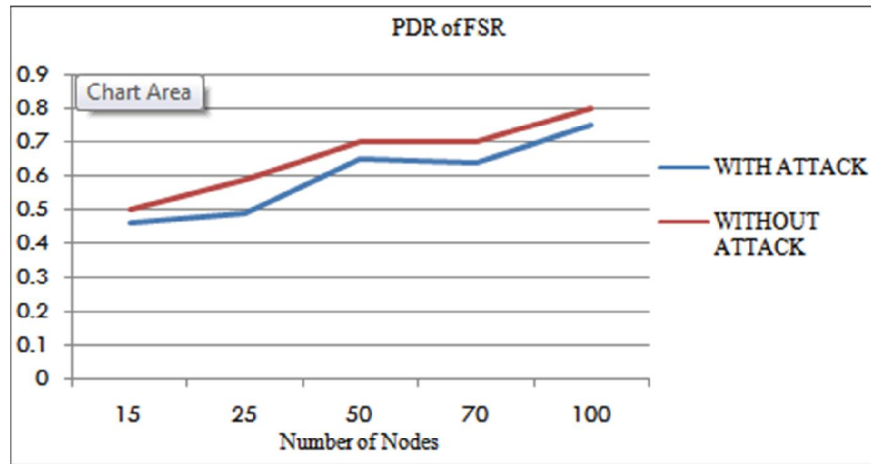


Fig 1. Packet Delivery ratio of FSR

### D. Average Jitter

Jitter is the variation in the time between packets incoming, caused by network blockage, timing drift, or direction changes. It should be less for a routing protocol to perform better [13]. The average jitter with and without attack is shown in fig 4, 5 and 6. DYMO shows most excellent performance in terms of Jitter as compared to FSR and LANMAR Protocol .Performance decreases with increasing number of nodes.

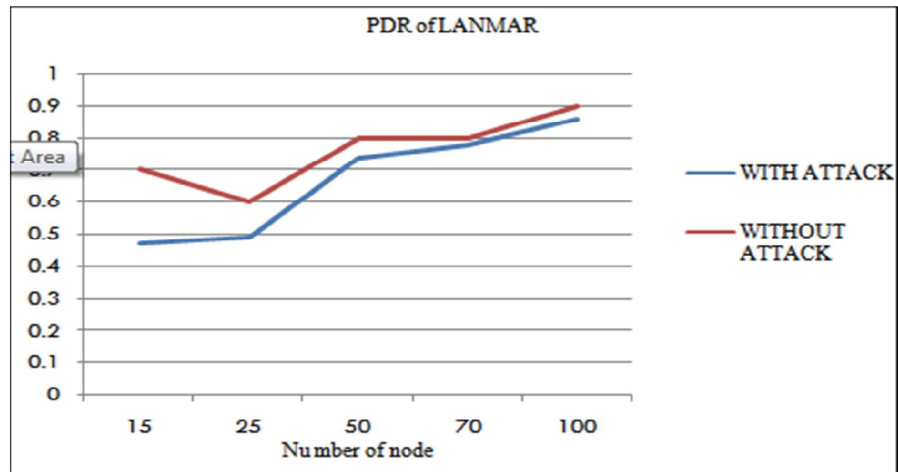


Fig 2. Packet Delivery ratio of LANMAR

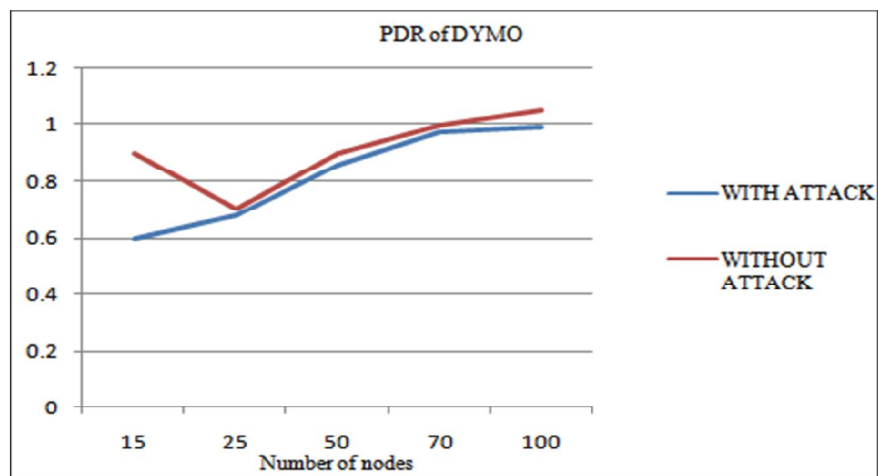


Fig 3. Packet Delivery ratio of DYMO

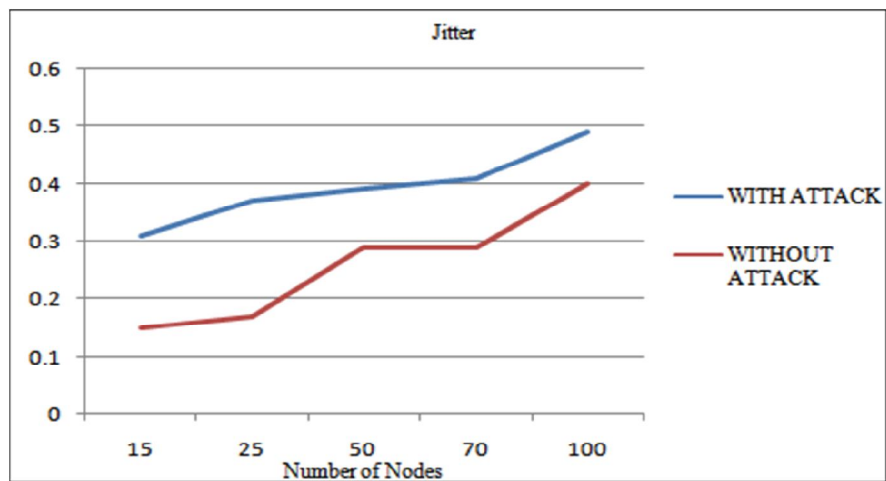


Fig 4. Average Jitter of FSR

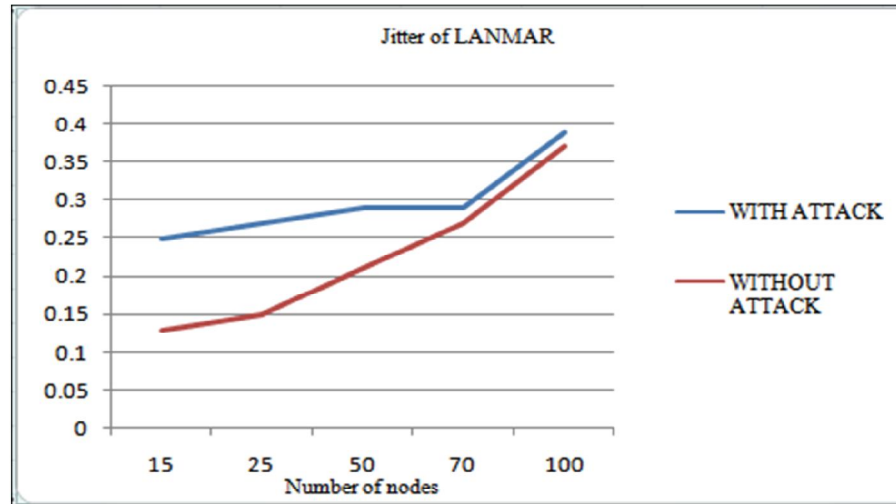


Fig 5. Average Jitter of LANMAR

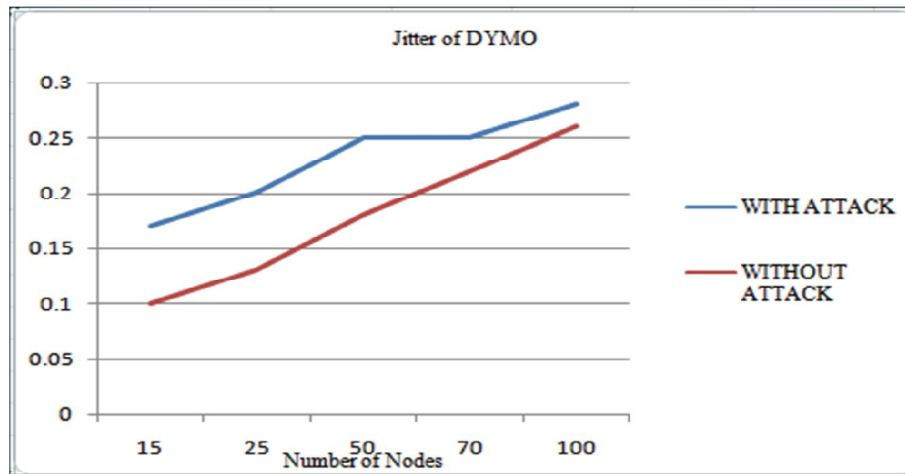


Fig 6. Average Jitter of DYMO

#### IV. CONCLUSION AND FUTURE WORK

The Performance of these routing protocols is evaluated with respect to two performance metrics such as packet delivery ratio and average jitter with and without black hole attack. According to our simulation results, DYMO With and without attack shows best performance than LANMAR and FSR in terms of packet delivery ratio and Average Jitter. DYMO has good packet delivery ratio and less average jittering than FSR and LANMAR. On the other hand, In the last Black hole attack affects the overall performance, It degrades the performance. In future, number of nodes, more sources, additional metrics such as average bound add up, routing overhead may be used.

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